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EXAMINER	
SEALEY, LANCE W	
ART UNIT	PAPER NUMBER
2671	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/584,025	COLLODI
	Examiner	**Art Unit**
	Lance W. Sealey	2671

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 July 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-79 and 82* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *40-78 and 82* is/are allowed.

6)☒ Claim(s) *1-16,18-20,23-37,39 and 79* is/are rejected.

7)☒ Claim(s) *17,21,22 and 38* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Allowable Subject Matter

1. Claims 40-78 and 82 are allowed, and claims 17, 21-22 and 38 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

2. The following is a statement of reasons for the indication of allowable subject matter: No prior art anticipates or suggests, in a method of generating a display comprising a plurality of pixels on a screen, in which, in the process of determining a specularity modulation value for a respective pixel, a second specular light intensity function value is obtained from a lookup table (claims 17, 38 and 82). Nor does any prior art anticipate or suggest, in a method of creating a computer generated image having at least one polygon surface represented by a plurality of pixels, in the process of interpolating the specular light intensity functions using the specularity modulation value to obtain a composite specularity value, using an interpolated vector to address a color map for each pixel (claim 21), dividing, at each pixel, an interpolated three-dimensional vector by its largest component, and using the divided values of the other two components to address a two-dimensional color map for each pixel (claims 22). Nor does any prior art suggest, in a method of creating a computer generated image having at least one polygon surface represented by a plurality of pixels, providing at least a pair of color intensity functions (claims 40 and 58). Claims 41-57 and 59-78 are allowed because of allowed claims 40 and 58,

respectively.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 3-9, 11, 15 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knittel et al. ("Knittel," U.S. Pat. No. 6,342,885) in view of Kazama et al. ("Kazama," U.S. Pat. No. 5,835,220).

5. Knittel, which discloses a method for illuminating volume data, also discloses, with respect to claim 1, in a method of creating a computer generated image (col.1, ll.40-43) having at least one polygon surface (col.2, ll.2-10) represented by a plurality of pixels (col.1, ll.44-51),

- determining a specularity modulation value for a respective pixel by retrieving the specularity modulation value
  (Knittel does not explicitly disclose determining a specularity modulation value <u>for a respective pixel</u>, but it would have been obvious to a person with ordinary skill in the art to determine a specularity modulation value for a respective pixel. Col.3, ll.58-63 disclose determining a specularity modulation value of voxel samples, which Knittel calls a specularity modulation factor. Col.1, ll.40-49 state that it is known that voxel values are converted to RGBa voxel values which are accumulated to pixel values which are projected onto a two-dimensional image plane for viewing. The specularity

modulation value for an invididual pixel can then be determined.)

from a memory
(Knittel does not explicitly disclose retrieving the specularity modulation value from a memory, but it would have been obvious to a person with ordinary skill in the art that the specularity modulation value would be retrieved from memory. The first mention of a specularity modulation value in Knittel is the specularity modulation factor at col.3, l.59, and the other mention is the specular lighting coefficient at col.10, ll.3-4. Since the specularity modulation factor/ specular lighting coefficient must reside somewhere, and this value does not appear to be calculated, the specularity modulation factor/specular lighting coefficient must be a constant stored in memory.)

- using a composite specularity value
(col.10, ll.2-6; the composite specularity value is the combination value of the specular lighting coefficients and the modulated specular intensity)

  to modulate pixel color of the computer generated image
(when the specularly modulated RGBa voxel values are accumulated to pixel values which are projected onto a two-dimensional image plane for viewing (see col.1, ll.40-49), the pixel colors are modulated.)

6. However, Knittel does not disclose providing at least a pair of specular light intensity functions, wherein each specular light intensity function is representative of the specular light reflected by a respective pixel at a different surface reflectance characteristic, or interpolating the specular light intensity functions using the specularity modulation value to obtain a composite specularity value. These elements are disclosed by the Kazama method and apparatus for detecting surface flaws. Kazama discloses providing at least a pair of specular light intensity functions (three specular light intensity functions--analyzers **210a, 210b, 210c**, FIG.20). The outputs of the analyzers are interpolated at col.31, l.66 to col.32, l.10 (a “central luminance” is chosen between the outputs). Each specular light intensity function is shown to be representative

of the specular light reflected by a respective pixel at a different surface reflectance characteristic at col.24, ll.20-22.

7. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Kazama methods of providing and interpolating specular light intensity functions with the Knittel methods of determining a specularity modulation value and using the composite specularity value. The Kazama aim of ascertaining flaws on a surface (Kazama, col.32, ll.18-20) is similar to the Knittel goal of distinguishing object surfaces from noise (Knittel, col.2, ll.58-59).

8. The other claims in this rejection will now be considered. With respect to claims 3-4, Knittel discloses scaling (i.e., multiplying by a constant) the interpolated specularity value by the modulation value at col.3, ll.58-63.

9. Concerning claims 5-7, neither Knittel nor Kazama directly disclose scaling the interpolated specularity value by a derivative of the modulation value (claim 5), or maximum, minimum or intermediate reflectivity functions (claims 6-7). However, scaling the interpolated specularity value by a derivative of the modulation value is obvious because once a method of obtaining the modulation value is arrived at, the modulation value can be any number, and in the case of the reflectivity function of claims 6-7, the examiner is interpreting the reflectivity function to be, for all practical purposes, the same as the modulation value because the

applicant's specification states that the specularity modulation value "simulates reflectivity" (p.2, ll.6-8, 18-19).

10. Regarding claim 8, Knittel renders obvious the step of determining the specularity modulation value in col.3, ll.42-44 because there must be at least one "procedural calculation" being done in the Knittel gradient magnitude modulation unit in order to determine the specularity modulation value.

11. With respect to claims 9, 11 and 15, Knittel renders obvious a calculation based on surface offset coordinates in the step of determining the specular modulation value (claim 9), assigning a pair of surface coordinates for each pixel and using the surface coordinates as inputs (claim), and using at least one surface value for a respective pixel as an input to the procedural calculation (claim 15) in the eighth sentence of the Abstract: combining the specular intensity with the specular modulation factor creates an additional specular intensity at another pixel, which is an offset distance from the pixel for which the first specular intensity was calculated.

12. Finally, concerning claim 18, Kazama discloses determining a specular light intensity function at col.31, l.65 to col.32, l.5, and Knittel discloses deriving the value of another specular light intensity function from the first specular light intensity function at col.3, ll.58-62.

13. Therefore, in view of the foregoing, claims 1, 3-9, 11, 15 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knittel and Kazama.

14. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Knittel in view of

Kazama and further in view of Jaeger et al. ("Jaeger," U.S. Pat. No. 5,936,613).

15. Providing at least a pair of specular light intensity functions by providing a maximum specular light intensity function and a minimum specular light intensity function is disclosed by the Jaeger system with changeable graphics in col.18, ll.47-59 (the minimum specular light intensity function is the point on the band at which reflectivity is at a minimum, and the maximum specular light intensity function is the point on the band at which reflectivity is at a maximum).

16. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Knittel-Kazama method of generating a display with the Jaeger ability to provide maximum and minimum specular light intensity functions. The ideal position for an object depends on where that object reflects light (Jaeger, col.18, l.64-col.19, l.3).

17. Accordingly, in view of the foregoing, claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Knittel, Kazama and Jaeger.

18. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Knittel in view of Kazama and further in view of Laferriere (U.S. Pat. No. 6,226,005).

19. Neither Knittel nor Kazama disclose determining the specularity modulation value by retrieving the specularity modulation from a two-dimensional map contained in a texture memory. However, this element is disclosed by the Laferriere method and system for determining and/or using illumination maps in rendering images at the third sentence of the

Abstract.

20. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Knittel-Kazama method of generating a display with the Laferriere ability to determine the specularity modulation. This eliminates the necessity for the rendering engine to avoid having to calculate the contributions of lights in the scene during rendering, thus reducing the rendering time (Laferriere, Abstract, second sentence).

21. Accordingly, in view of the foregoing, claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Knittel, Kazama and Laferriere.

22. Claims 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knittel in view of Kazama and further in view of Moller et al. ("Moller," Real-Time Rendering).

23. With respect to both claims, Moller discloses using the surface coordinates as inputs to a function that generates bump map values for each respective pixel (claim 13), and, since bump map values are texture map values, texture map values for each respective pixel (claim 12), from the second paragraph of p.137 to p.138: the surface coordinates are *x, y, z* vectors.

24. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Knittel-Kazama method of generating a display with the Moller bump map generation. Making part of an image appear uneven fosters image realism (Moller, p.136, section 5.7.5, first paragraph).

25. Accordingly, in view of the foregoing, claims 12-13 are rejected under 35 U.S.C. 103(a)

as being unpatentable over Knittel, Kazama and Moller.

26. Claims 14 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knittel in view of Kazama and further in view of Parikh et al. ("Parikh," U.S. Pat. No. 6,175,367).

27. Parikh, in disclosing a method and system for real time illumination of computer generated images, also discloses, with respect to claim 14, specifying a specular exponent value for at least one of the pair of specular light intensity functions at col.4, ll.42-48 and 56-63. Every specular light intensity function, represented by a vertex, will have a specular exponent. Therefore, any time the specular modulation value is calculated between two specular light intensity functions, both specular light intensity functions will have a specular exponent value.

28. Accordingly, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Knittel-Kazama method of generating a display with the Parikh method of shading calculations. Parikh allows Knittel-Kazama to reduce resource intensive calculation in shading (Parikh, col.4, ll.23-26).

29. The other claim in the rejection will now be considered. With respect to claim 16, Parikh discloses using at least one light source value for a respective pixel as an input to the at least one procedural calculation.

30. Accordingly, in view of the foregoing, claims 14 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knittel in view of Kazama and Parikh.

31. Claims 19, 24-30, 32, 36 and 39 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Knittel in view of Kazama and further in view of Malzbender et al. ("Malzbender", U.S. Pat. No. 6,64,013).

32. Knittel, which discloses a method for illuminating volume data, also discloses, with respect to claim 19, in a method of creating a computer generated image (col.1, ll.40-43) having at least one polygon surface (col.2, ll.2-10) represented by a plurality of pixels (col.1, ll.44-51),

- determining a specularity modulation value for a respective pixel by retrieving the specularity modulation value
  (Knittel does not explicitly disclose determining a specularity modulation value <u>for a respective pixel</u>, but it would have been obvious to a person with ordinary skill in the art to determine a specularity modulation value for a respective pixel. Col.3, ll.58-63 disclose determining a specularity modulation value of voxel samples, which Knittel calls a specularity modulation factor. Col.1, ll.40-49 state that it is known that voxel values are converted to RGBa voxel values which are accumulated to pixel values which are projected onto a two-dimensional image plane for viewing. The specularity modulation value for an invididual pixel can then be determined.)

- using a composite specularity value
  (col.10, ll.2-6; the composite specularity value is the combination value of the specular lighting coefficients and the modulated specular intensity)

  to modulate pixel color of the computer generated image
  (when the specularly modulated RGBa voxel values are accumulated to pixel values which are projected onto a two-dimensional image plane for viewing (see col.1, ll.40-49), the pixel colors are modulated.)

33. However, Knittel does not disclose providing at least a pair of specular light intensity functions, wherein each specular light intensity function is representative of the specular light reflected by a respective pixel at a different surface reflectance characteristic, or interpolating the

specular light intensity functions using the specularity modulation value to obtain a composite specularity value. These elements are disclosed by the Kazama method and apparatus for detecting surface flaws. Kazama discloses providing at least a pair of specular light intensity functions (three specular light intensity functions--analyzers **210a, 210b, 210c**, FIG.20). The outputs of the analyzers are interpolated at col.31, l.66 to col.32, l.10 (a "central luminance" is chosen between the outputs). Each specular light intensity function is shown to be representative of the specular light reflected by a respective pixel at a different surface reflectance characteristic at col.24, ll.20-22.

34. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Kazama methods of providing and interpolating specular light intensity functions with the Knittel methods of determining a specularity modulation value and using the composite specularity value. The Kazama aim of ascertaining flaws on a surface (Kazama, col.32, ll.18-20) is similar to the Knittel goal of distinguishing object surfaces from noise (Knittel, col.2, ll.58-59).

35. However, neither Knittel nor Kazama disclose generating a polygon surface represented by a plurality of vectors for each pixel in said plurality of pixels, the vectors including a light source vector, a surface normal vector and a view vector. These elements are disclosed by the Malzbender method and apparatus for enhancing shape perception of parametric texture maps. Malzbender discloses the light source vector, view vector (Malzbender calls this an eye point

vector) and surface normal vector at col.5, ll.6-7. The “for each pixel” and "in a plurality of pixels" limitations for the light source and view vectors are disclosed at col.5, ll.11-14. The "generating a polygon surface represented by a plurality of vectors” limitation is disclosed at col.5, ll.6-14.

36. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Malzbender method of enhancing shape perception with the Knittel-Kazama methods of determining a specularity modulation value and using the composite specularity value. Use of vectors improves realism (Malzbender, col.5, ll.8-10).

37. The other claims in this rejection will now be considered. With respect to claims 24-25 and 63-64, Knittel discloses scaling the interpolated specularity value by the modulation value at col.3, ll.58-63.

38. Concerning claims 26-28, neither Knittel, Kazama nor Malzbender directly disclose scaling the interpolated specularity value by a derivative of the modulation value (claim 26), or maximum, minimum or intermediate reflectivity functions (claims 27-28). However, scaling the interpolated specularity value by a derivative of the modulation value is obvious because once a method of obtaining the modulation value is arrived at, the modulation value can be any number, and in the case of the reflectivity function of claims 27-28, the examiner is interpreting the reflectivity function to be, for all practical purposes, the same as the modulation value because

the applicant's specification states that the specularity modulation value "simulates reflectivity" (p.2, ll.6-8, 18-19).

39. Regarding claim 29, Knittel renders obvious the step of determining the specularity modulation value in col.3, ll.42-44 because there must be at least one "procedural calculation" being done in the Knittel gradient magnitude modulation unit in order to determine the specularity modulation value.

40. With respect to claims 30, 32 and 36, Knittel renders obvious a calculation based on surface offset coordinates in the step of determining the specular modulation value (claim 30), assigning a pair of surface coordinates for each pixel and using the surface coordinates as inputs (claim 32), and using at least one surface value for a respective pixel as an input to the procedural calculation (claim 36) in the eighth sentence of the Abstract: combining the specular intensity with the specular modulation factor creates an additional specular intensity at another pixel, which is an offset distance from the pixel for which the first specular intensity was calculated.

41. Finally, concerning claim 39, Kazama discloses determining a specular light intensity function at col.31, l.65 to col.32, l.5, and Knittel discloses deriving the value of another specular light intensity function from the first specular light intensity function at col.3, ll.58-62.

42. Therefore, in view of the foregoing, claims 19, 24-30, 32, 36 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knittel, Kazama and Malzbender.

43. Claims 20, 35 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Knittel in view of Kazama and Malzbender and further in view of Parikh.

44. With respect to claim 20, Parikh discloses assigning a unique modulation value at each of the polygon's vertices, rasterizing the polygon surface and interpolating the modulation values at the vertices throughout the rasterized polygon surface to provide a modulation value for each pixel at col.4, ll.51-60. The specularity modulation value is "the difference term at the pixel."

45. Accordingly, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Knittel-Kazama-Malzbender method of generating a display with the Parikh method of shading calculations. Parikh allows Knittel-Kazama-Malzbender to reduce resource intensive calculation in shading (Parikh, col.4, ll.23-26).

46. The other claims in the rejection will now be considered. With respect to claim 35, Parikh discloses specifying a specular exponent value for at least one of the pair of specular light intensity functions at col.4, ll.42-48 and 56-63. Every specular light intensity function, represented by a vertex, will have a specular exponent. Therefore, any time the specular modulation value is calculated between two specular light intensity functions, both specular light intensity functions will have a specular exponent value. Regarding claim 37, Parikh discloses using at least one light source value for a respective pixel as an input to the at least one procedural calculation.

47. Therefore, in view of the foregoing, claims 20, 35 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knittel, Kazama, Malzbender and Parikh.

48. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Knittel in view of Kazama and Malzbender and further in view of Jaeger et al. ("Jaeger," U.S. Pat. No. 5,936,613).

49. With respect to both claims, providing at least a pair of specular light intensity functions by providing a maximum specular light intensity function and a minimum specular light intensity function is disclosed by the Jaeger system with changeable graphics in col.18, ll.47-59 (the minimum specular light intensity function is the point on the band at which reflectivity is at a minimum, and the maximum specular light intensity function is the point on the band at which reflectivity is at a maximum).

50. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Knittel-Kazama-Malzbender method of generating a display with the Jaeger ability to provide maximum and minimum specular light intensity functions. The ideal position for an object depends on where that object reflects light (Jaeger, col.18, l.64-col.19, l.3).

51. Accordingly, in view of the foregoing, claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Knittel, Kazama, Malzbender and Jaeger.

52. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Knittel in view of Kazama and Malzbender and further in view of Laferriere (U.S. Pat. No. 6,226,005).

53. Neither Knittel nor Kazama disclose determining the specularity modulation coordinate by retrieving the specularity modulation from a two-dimensional map contained in a texture

memory. However, this element is disclosed by the Laferriere method and system for determining and/or using illumination maps in rendering images at the third sentence of the Abstract.

54. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Knittel-Kazama-Malzbender method of generating a display with the Laferriere ability to determine the specularity modulation. This eliminates the necessity for the rendering engine to avoid having to calculate the contributions of lights in the scene during rendering, thus reducing the rendering time (Laferriere, Abstract, second sentence).

55. Accordingly, in view of the foregoing, claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Knittel, Kazama, Malzbender and Laferriere.

56. Claims 33-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knittel in view of Kazama and Malzbender and further in view of Moller et al. ("Moller," Real-Time Rendering).

57. With respect to both claims, Moller discloses using the surface coordinates as inputs to a function that generates bump map values for each respective pixel (claim 13), and, since bump map values are texture map values, texture map values for each respective pixel (claim 12), from the second paragraph of p.137 to p.138: the surface coordinates are *x, y, z* vectors.

58. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Knittel-Kazama-Malzbender method of generating a display with

the Moller bump map generation. Making part of an image appear uneven fosters image realism (Moller, p.136, section 5.7.5, first paragraph).

59. Accordingly, in view of the foregoing, claims 33-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knittel, Kazama, Malzbender and Moller.

60. Claim 79 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moller in view of Laferriere, Knittel, Parikh and Jaeger.

61. Moller further discloses generating a polygon surface represented by a plurality of vectors for each pixel in said plurality of pixels, the vectors including a light source vector, a surface normal vector and a view vector in Section 4.3.2, pp.73-77.

62. However, Moller does not disclose determining, in real time, using one or more values from a map to determine a reflectivity of the polygon surface for a respective pixel in the polygon and using the determined reflectivity to calculate the specular reflection (specular light intensity function) at the respective pixel in the polygon. Laferriere discloses determining a reflectivity of the polygon surface for a respective pixel in the polygon in real time using one or more values from a map at col.15, ll.34-42.

63. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Moller-disclosed vectors with the Laferriere method of determining reflectivity. This eliminates the necessity for the rendering engine to avoid having to

calculate the contributions of lights in the scene during rendering, thus reducing the rendering time (Laferriere, Abstract, second sentence).

64. However, neither Moller nor Laferriere disclose using the determined reflectivity to calculate the specular reflection at a vertex of the polygon. This is disclosed by Knittel at col.3, ll.58-63.

65. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Moller-Laferriere method with the Knittel method of determining reflectivity. This would promote more realism in rendering by providing for modulated specular intensities (Knittel, col.3, l.60).

66. However, neither Moller, Laferriere nor Knittel disclose using the determined reflectivity to calculate the specular reflection at the respective pixel in the polygon. This is disclosed by Parikh at col.4, ll.51-60.

67. Accordingly, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Moller-Laferriere-Knittel method with the Parikh method of shading calculations. Parikh allows Moller-Lafierre-Knittel to reduce resource intensive calculation in shading (Parikh, col.4, ll.23-26).

68. However, neither Moller, Laferriere, Knittel nor Parikh disclose calculating the specular reflection using two or more specularity functions. This element is disclosed by Jaeger at col.18, ll.47-59 (the minimum specular light intensity function is the point on the band at which

reflectivity is at a minimum, and the maximum specular light intensity function is the point on the band at which reflectivity is at a maximum).

69. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to use the Moller-Lafierre-Knittel-Parikh method with the Jaeger ability to provide maximum and minimum specular light intensity functions. The ideal position for an object depends on where that object reflects light (Jaeger, col.18, l.64-col.19, l.3).

70. Accordingly, in view of the foregoing, claim 79 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moller, Lafierre, Knittel, Parikh and Jaeger.

Remarks

71. The examiner has considered the claim amendments and applicant arguments and has amended the rejections accordingly. However, since the claims have also been amended, **THIS ACTION IS MADE FINAL.** See MPEP 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

72. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however,

will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

Any inquiry concerning this communication or earlier communications from the Office should be directed to the examiner, Lance Sealey, whose telephone number is (703) 305-0026. He can be reached from 7:00 am-3:30 pm EST Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman, can be reached at (703) 305-9798.

Any response to this action should be mailed to:

MS AF

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

or faxed to:

(703) 872-9306

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA, Sixth Floor (Receptionist).

Mark Zimmerman

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